CHAPTER 2

PROPOSED ACTION AND ALTERNATIVES

This chapter details the No Action and two action alternatives developed to meet this project's Purpose and Need while resolving resource conflicts. The chapter includes the following major sections:

- Scope of Alternatives
- Development of Alternatives
- Alternative Elements Considered but Eliminated from Detailed Analysis
- Description of Alternatives Carried Forward for Detailed Analysis
- Comparison of Alternatives and Summary of Impacts
- National Economic Development (NED) Alternative

2.1 SCOPE OF ALTERNATIVES

This chapter describes three alternatives: A (the No Action Alternative), B (Relocate Main Street Diversion), and C (Replace Main Street Diversion). As defined in NEPA, the development of alternatives is a necessary part of the environmental impacts analysis process. According to CEQ regulations for implementing NEPA, the NEPA process should:

> present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decision maker and the public (40 CFR § 1502.14).

This includes consideration of a "range of alternatives" (40 CFR § 1505.1(e)). This range must include only reasonable alternatives, meaning those alternatives that are both technologically practical and economically viable. The purpose of developing a range of alternative actions is to address issues and concerns expressed during the public scoping process. The issues identified during this project are listed in Section 1.6.2.

Alternatives found to be unreasonable can be dismissed from detailed study; however, a brief discussion of the reasons for their elimination must be included (see Section 2.3).

2.2 DEVELOPMENT OF ALTERNATIVES

The action alternatives carried forward for detailed analysis in this EIS were formulated from several sources. To initiate the process, a diverse group of stakeholders was formed to identify alternative elements and determine resource priorities.

The stakeholder group included representatives from Cedar City Corporation, the NRCS, UDOT, UDWRi in the State Engineer's Office, Iron County, Cedar Valley Water Community, and the Southwest Wildlife Foundation. A project kick-off and conceptual alternatives development workshop was held in Cedar City on January 24–25, 2005. Key to this discussion was the development of the Purpose and Need statement that appears in Chapter 1 of this document. Much of the discussion centered on the need to move the irrigation diversion structure located just west of the Main Street Bridge to alleviate sedimentation under the bridge and subsequent decreased channel capacity issues. Discussion focused on relocating the diversion structure up into Cedar Canyon at an elevation that would support the construction of a pressurized irrigation system in the future. Although several conceptual ideas were developed, no final decisions regarding alternatives for the project were made during this meeting.

To assist the stakeholder group in evaluating potential alternatives, Bowen, Collins & Associates, the engineering firm designing the project, developed a technical memorandum that presented several engineering options for relocating the diversion structure. Three potential locations in the canyon, as well as a location in the vicinity of 200 East in Cedar City, were identified. In addition, the memorandum discussed the possibility of reconstructing a redesigned diversion structure in its present location west of Main Street. These preliminary alternatives were presented to the public for comment during the public open-house workshop held at the Cedar City Library on March 10, 2005.

During the public meeting, attendees were asked to provide comments on issues of concern and the preliminary alternatives. The public was also encouraged to submit their own alternatives and alternative elements for evaluation.

Following the public open house, the stakeholder group held another alternatives development workshop on March 22, 2005. The group considered comments gathered during the public meeting, which were then summarized in a preliminary scoping report. Discussion during this meeting focused on adherence to the project Purpose and Need statement, potential resource conflicts, and economic feasibility issues that would need to be addressed in the subsequent National Economic Development (NED) analysis (see Section 3.12) required by the NRCS. Several alternatives and alternative elements were eliminated from detailed analysis at this time (see Section 2.3).

During this March 22 discussion, two action alternatives were selected for detailed analysis in the EIS in addition to the No Action Alternative. These alternatives included moving the Main Street Diversion to 200 East (Alternative B) and modifying the Main Street Diversion in its current location (Alternative C; see Section 2.4). The No Action Alternative would require the continuation of current channel maintenance.

2.3 Alternative Elements Considered but Eliminated from Detailed Analysis

2.3.1 Dual Channels

This alternative entailed the construction of an additional channel parallel to the existing Coal Creek channel for the purpose of conveying a 100-year flood. The NRCS deemed this an untenable alternative, due to the fact that there is insufficient space adjacent to the existing channel to accommodate a new channel with sufficient capacity to convey a 100-year flood. In addition, the ground disturbance and environmental impacts from such an undertaking would be extensive.

2.3.2 Pedestrian Underpass Used as Flood Diversion

This alternative was proposed to increase channel capacity at the Main Street Bridge and to provide a connective pedestrian link across Main Street. The alternative was eliminated from further analysis, as it did not address the fundamental issues of channel constriction and gradient that contribute to ongoing sedimentation and subsequent loss of channel capacity in this area. An enclosed pedestrian pathway under the bridge would present another potential constriction under the bridge, in that it would not let large debris (e.g., uprooted trees) pass under the bridge. Additionally, a pedestrian pathway would be inundated during high flow, preventing full use of the proposed parkway and presenting public safety issues.

2.3.3 Parkway for Flood Conveyance

This alternative proposed that the constructed parkway be used to augment the capacity of the channel to convey a 100-year flood. This alternative was dismissed from detailed analysis because existing and proposed City facilities and infrastructure would be put at risk of flood-related damage and loss. The parkway represents a significant community investment. Adding flooding risk to developed areas outside of the creek channel runs counter to the Purpose of and Need for the project and would add to the market value costs that must be evaluated in determining the benefit-cost ratio (see Section 3.12) for the project.

2.3.4 Diversion Dikes/Walls

This alternative proposed the construction of dikes and walls to keep floodwaters in the channel. Though some dikes are being proposed as part of the action alternatives, this alternative was eliminated from further consideration, as it did not address existing channel constrictions and gradient issues that impact channel capacity and sedimentation. Building dikes and levees to increase channel capacity will not prevent the accumulation of sediment at the Main Street Diversion or the reduction in flow capacity at the Main Street Bridge.

2.3.5 Storage Ponds to Capture Water

To handle large volumes of floodwater and benefit area wells and aquifers, it was proposed that groundwater recharge "ponds" be constructed in the valley to capture floodwaters and recharge the groundwater. Also proposed was a variation on this alternative: to divert flood waters into the gravel pits west of I-15 for the same purpose. During spring flooding of 2005, some water was diverted and contained in these areas; however, this alternative was eliminated from further consideration because it does not address channel capacity deficiencies and because of the high level of suspended fine sediments in the water (clay and small silt particles) that would effectively plug infiltration/recharge areas, necessitating constant maintenance. Additionally, the size of the ponds that would be required to store the projected floodwaters would be so large that their construction would result in large impacts to existing lands and/or habitat in the project area.

2.3.6 Off-stream Storage Reservoir

This proposal involves constructing a diversion structure at Coal Creek in Cedar Canyon with an associated gravity flow pipeline to an off-stream, water storage/reservoir structure. An additional gravity flow pipeline from the dam site to a water treatment plant would also be constructed, if desired, and a gravity flow pressurized pipeline would be built in the existing UDOT right-of-way (ROW). The entire reservoir and the dam would be built on public lands.

The purpose for this alternative is primarily to serve irrigation needs and not flood control. Thus, this alternative was eliminated from further consideration because it did not meet Purpose and Need as expressed in Chapter 1 and because of the resource conflict caused by dewatering Coal Creek through a portion of Cedar Canyon and where it passes through the City. This alternative also has the risk of negatively impacting groundwater recharge and well water rights downstream.

2.3.7 High-flow Diversion

This alternative sought to maintain at least 150 cfs flow in the existing channel during high-flow events. When flows exceed 150 cfs, the excess water would be diverted out of the channel. This alternative was eliminated from further analysis for the same reasons identified under Sections 2.3.1 and 2.3.3, above. Given existing development, there is not sufficient room to safely accommodate floodwater outside of the channel.

2.3.8 Extend Project West of I-15

This alternative proposed to continue the flood control improvements west of I-15 and into the valley. This alternative was eliminated from detailed analysis because the legislative appropriation for this project was secured to address flood control concerns only within the

City and, more specifically, for improvements east of I-15. Accordingly, this use of appropriated funds is not authorized, and currently there are not adequate funds to implement long-term channel modifications or improvements west of I-15.

It should be noted that Iron County is currently in the process of applying for federal aid to address similar concerns west of I-15. It should also be noted that the Proposed Action would be completed regardless of any actions taken by the County. Though the County is attempting to obtain additional funding, such funding and any subsequent flood control activities are considered speculative, given the unpredictable nature of federal funding. Potential downstream (indirect and cumulative) impacts of flooding west of I-15 are disclosed in this document (see Section 3.13).

2.3.9 Flood Control without Altering Stream

The advocate of this alternative did not provide sufficient detail for analysis of this alternative. However, similar to other alternatives discussed in this section, there are some fundamental hydrologic issues that need to be resolved within the channel itself so that it is able to safely convey a 100-year flood. Failure to address the deficiencies of the existing channel does not meet the Purpose and Need for the project.

2.3.10 Restore and Maintain a Sinuous Channel

The idea to develop a sinuous and natural-looking channel was proposed as a project goal. While desirable in an aesthetic sense, such channels do not typically accommodate a 100-year flood event (the primary Purpose and Need in this EIS). Fluvial systems like Coal Creek tend to actively migrate across the alluvial plain that has developed through centuries of deposition from sediment-laden streams. High-volume events quickly change or destroy sinuous channels. In order for a sinuous channel to accommodate flood flows, it needs to have a wide, active floodplain. It may have been possible to implement an alternative like this 100 years ago, before Cedar City had encroached into the Coal Creek floodplain. Presently, urban development is too close to the stream to allow for reconstruction of a meandering channel with an active floodplain.

2.3.11 Relocate Diversion Point into Cedar Canyon

This alternative was presented at the open-house public meeting held March 10, 2005. It proposed relocating the Main Street Diversion upstream into the canyon to one of three potential sites.

This alternative was eliminated from further consideration, as its reason was not to meet the Purpose and Need of the project or to resolve specific resource conflicts, but to develop pressurized irrigation capability. In addition, the alternative was eliminated because of the resource conflict caused by dewatering Coal Creek through a portion of Cedar Canyon and where it passes through the City.

2.3.12 Pumping Station at 200 East

The purpose for installing a pumping station at this location would be to provide pressurized water for irrigation. This alternative was eliminated from further consideration, as its reason was not to meet the Purpose and Need of the project or to resolve specific resource conflicts, but to develop pressurized irrigation capability. Such an alternative is beyond the scope and budget for this project.

2.3.13 Coal Creek Buffer Zone to Limit Development

This is a common-sense approach to limiting property damage in the 100- and 500-year floodplains for future development in these areas. Unfortunately, there is currently substantial commercial, industrial, and residential development in these floodplains that would be impacted by implementation of this alternative; therefore, this alternative is not feasible. It was eliminated from further consideration, as it did not meet the Purpose of and Need for the project to reduce the FEMA floodplain and reduce impacts to existing development in the existing FEMA floodplain.

2.3.14 Vegetation to Stabilize Streambanks

Using vegetation to help stabilize streambanks is an action that is frequently recommended as mitigation for ground-disturbing activities (see Chapter 3). However, this action alone does not meet the Purpose of and Need for the project to increase the flow capacity of the channel, and thereby reduce flood-related impacts in the community.

2.4 Description of Alternatives Carried Forward for Detailed Analysis

2.4.1 Alternative A: No Action

The No Action Alternative proposes to continue channel sediment maintenance and streambank hardening activities as they are currently managed. The Main Street diversion/drop structure would remain in its current location and continue in its present state to serve existing irrigators. Sediment under the Main Street Bridge would continue to be dredged by UDOT as it has in the past. There would be no modifications to the channel cross section or gradient. The 100- and 500-year floodplains as depicted on current FEMA floodplain maps would remain as they are (Figure 2.1). The parkway that extends from the old UP&L drop structure down to the sports fields in town would remain in its current state, with no additional trails connecting to the Bicentennial Park or west of I-15.

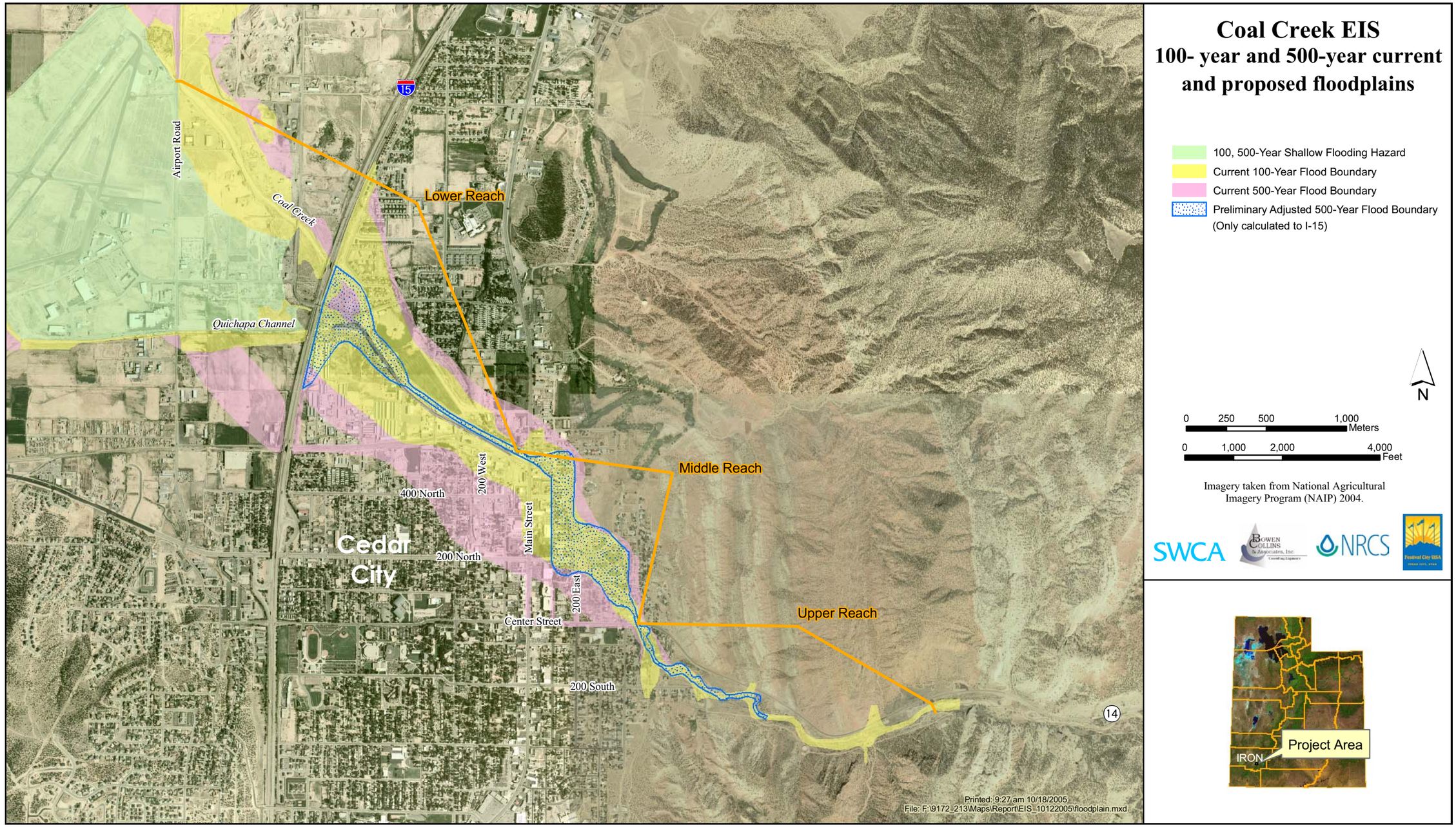

Figure 2.1. 100- and 500-year current and proposed floodplains.

THIS PAGE INTENTIONALLY LEFT BLANK

2.4.2 ELEMENTS COMMON TO THE ACTION ALTERNATIVES B AND C

Both of the action alternatives share several common elements. To avoid unnecessary repetition in this document, they are discussed below. The fundamental difference between the action alternatives is the location of the Main Street diversion structure and the associated pipe required to return irrigation water to the existing canal heads.

2.4.2.1 GENERAL

The 100-year discharge used by FEMA to develop the floodplain boundaries for Coal Creek is approximately 8,500 cfs. However, based on historical records, this estimated magnitude may be high. New statistical analyses reduce the current FEMA 100-year flood magnitude down to a number between 5,500 cfs and 6,000 cfs (Bowen, Collins & Associates 2005). It is proposed to use this lower 100-year flood magnitude as the design flood for recommended improvements in Alternatives B and C (Figure 2.1).

Access to the streambanks, the channel bottom at key locations, and adjacent lands for locating dredge material would be necessary. A continuous maintenance easement should be provided adjacent to the channel, and space to construct temporary channel access ramps should be provided along the channel throughout the City.

Channel modifications involving changing channel cross sections, altering the stream gradient in particular sub-reaches, stabilizing actively eroding banks, and constructing levees are activities that would take place under both action alternatives. Actions anticipated for each sub-reach are listed below (Sections 2.4.2.3–2.4.2.8). Typical proposed channel cross sections are shown in Figure 2.2.

Bank stabilization would be accomplished by laying the river banks back to a stable slope that supports channel stabilization methods and then armoring the banks via the use of rock (riprap), vegetation, soil cement, erosion control fabric, or some combination of these items. Where possible, existing riparian habitat and vegetation will be preserved on the streambanks. Bank stabilization improvements would be associated with any recommended channel modifications that require the channel being made wider or deeper.

2.4.2.2 PARKWAY

The parkway alignment presented in this document is conceptual, and several assumptions are used for purposes of analysis. The proposed parkway and trail alignment would be the same for both action alternatives (Figures 2.3 and 2.4) except for minor differences where the parkway crosses Main Street. These parkway connection options are described in Sections 2.4.3 and 2.4.4 and are analyzed with the alternatives in each resource section of Chapter 3.

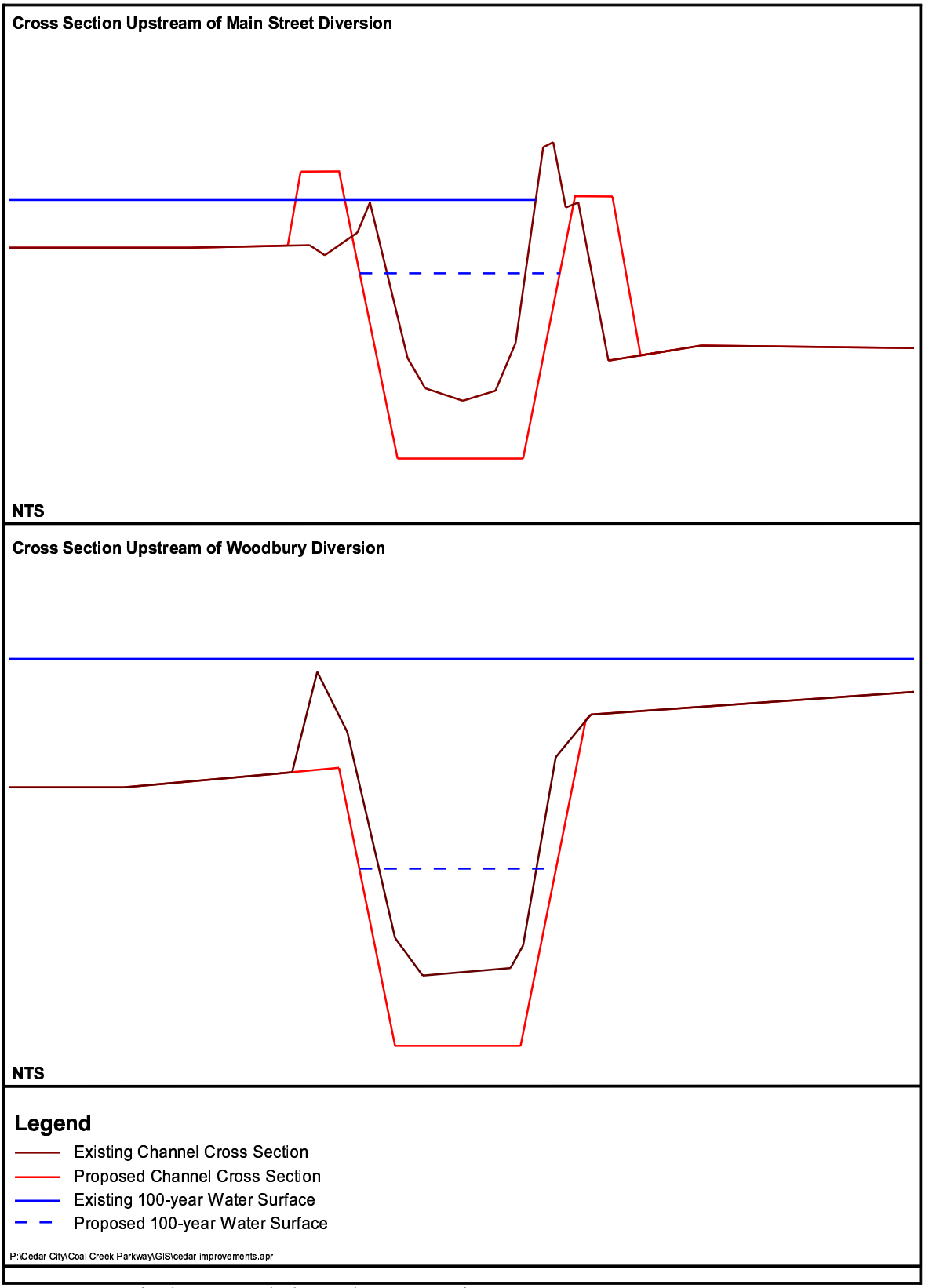

Figure 2.2. Typical proposed channel cross sections.

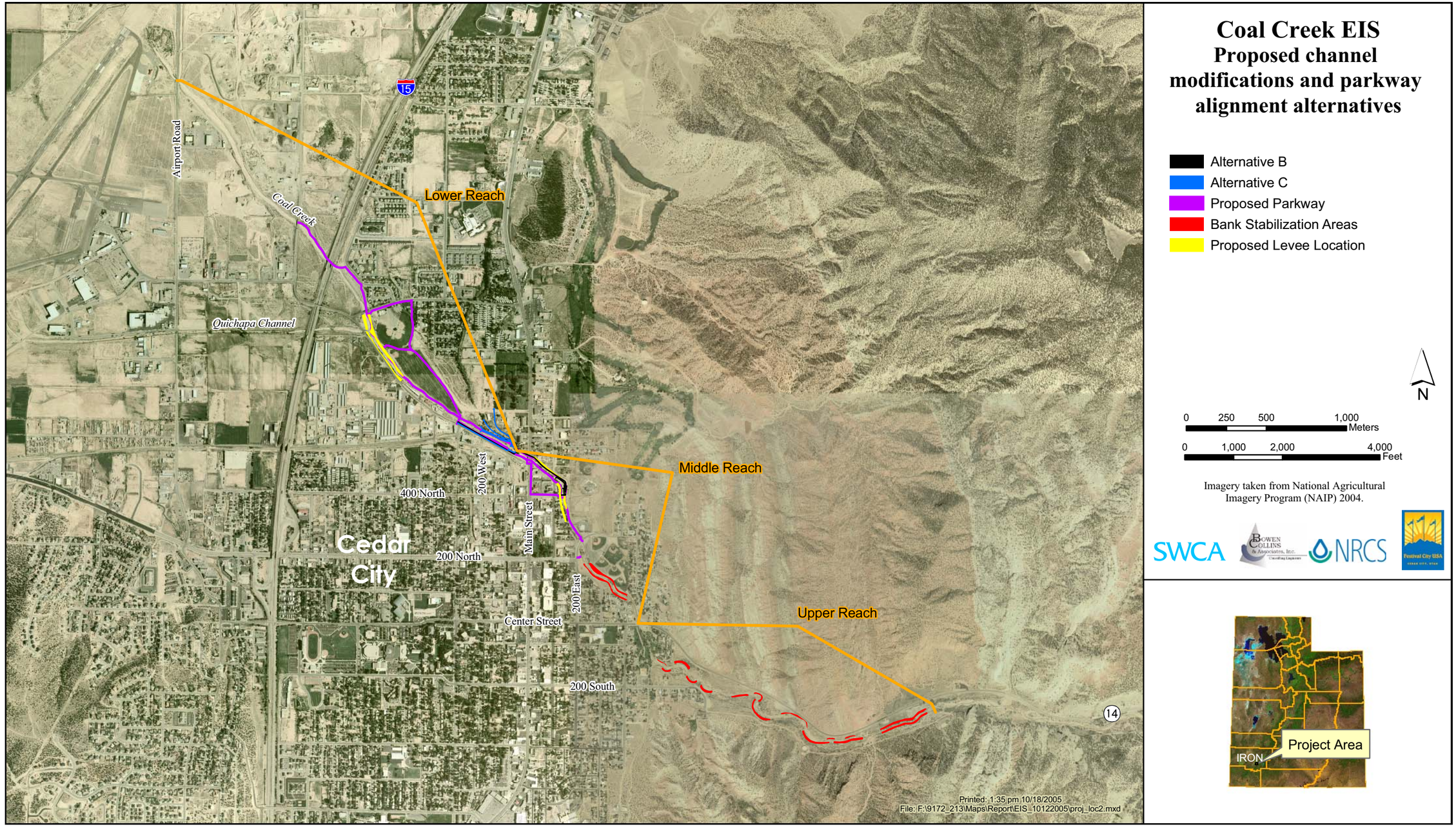

Figure 2.3. Proposed channel modifications and parkway alignment alternatives.

THIS PAGE INTENTIONALLY LEFT BLANK

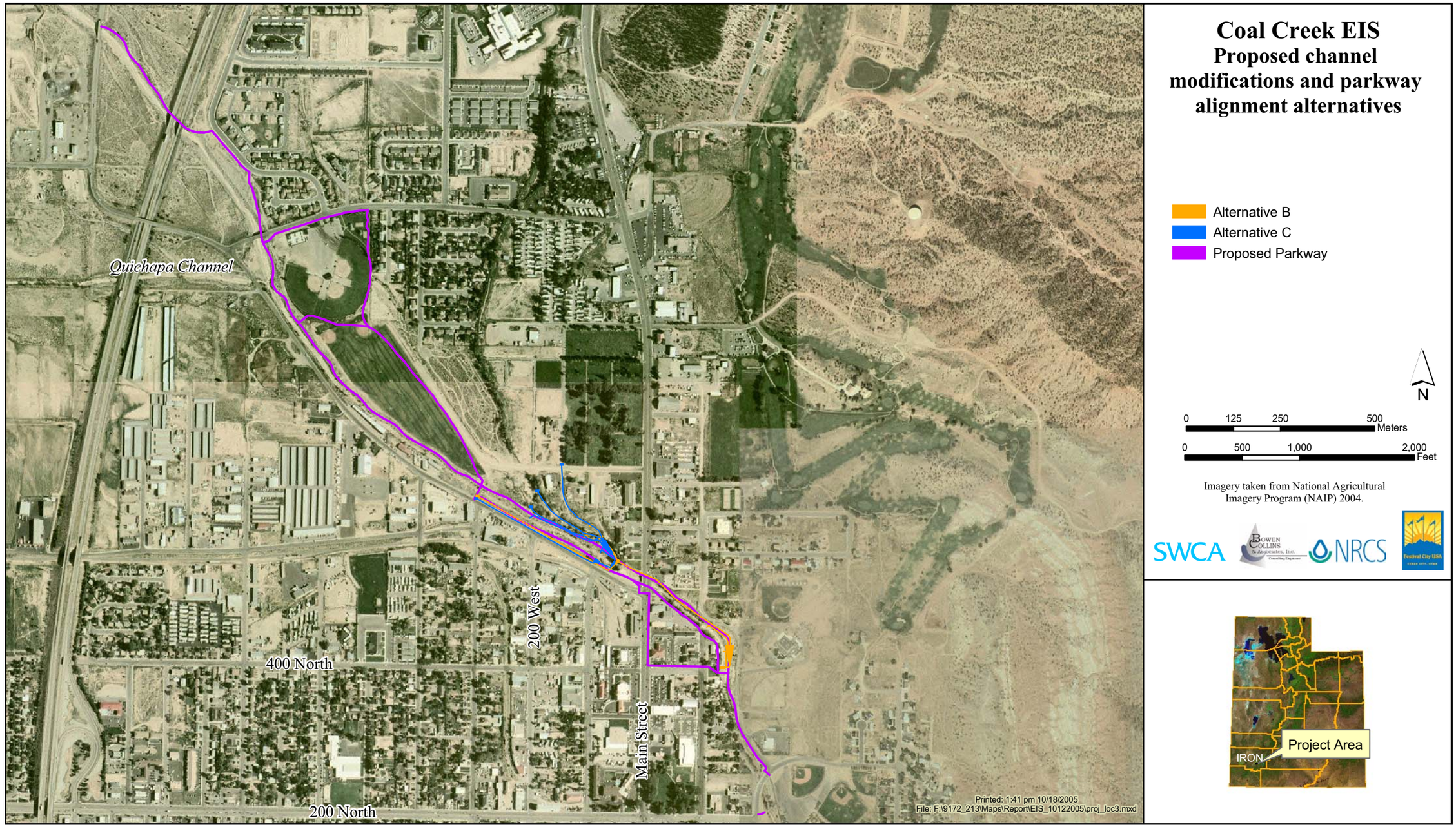

Figure 2.4. Enlarged view of proposed channel modifications and parkway alignment alternatives.

THIS PAGE INTENTIONALLY LEFT BLANK

The parkway would vary in width along the corridor, but an average width of 25 feet is assumed for analysis. Analyses assumed 25% native vegetation (increasing in density closer to Cedar Canyon and existing parkway) and 75% non-native vegetation (increasing in density as the parkway moves away from the canyon environment).

2.4.2.3 Sub-reach A (UP&L Drop Structure to Center Street Bridge)

The action alternatives would stabilize actively eroding areas near existing utilities, roads, trails, and other existing infrastructure. Potential areas that may be stabilized are identified in Figure 2.3.

2.4.2.4 Sub-reach B (Center Street Bridge to 200 East Bridge)

Actively eroding areas in this sub-reach would be stabilized. Potential areas are identified in Figure 2.3.

Both action alternatives would modify the channel cross sections to be narrower where lateral channel migration has made the channel significantly wider than adjacent channel reaches. Channel cross sections in the vicinity of the historic pedestrian bridge would be widened. Typical cross sections are identified in Figure 2.2.

2.4.2.5 Sub-reach C (200 East Bridge to Main Street Diversion/Drop Structure)

This sub-reach contains the Main Street Diversion, which would be demolished and reconstructed in one of two locations (detailed in Alternatives B and C). The channel in this sub-reach would need to be widened and deepened to increase the channel slope from the existing Main Street diversion structure to a point approximately 2,000 feet upstream. Typical cross sections are shown in Figure 2.2.

It would also be necessary to construct flood control levees or place structural fill to provide needed channel capacity and freeboard in the two areas shown in Figure 2.4.

2.4.2.6 Sub-reach D (Main Street Diversion/Drop Structure to Woodbury Diversion Structure)

The Woodbury Diversion in this sub-reach would be reconstructed to be wider. The structure's downstream elevation drop would be reduced to 2-3 feet. Channel constrictions in this sub-reach would need to be alleviated by widening and deepening the channel (increasing channel slope to approximately 1.5%) from the existing Woodbury diversion structure to a point approximately 3,000 feet upstream. A typical cross section is identified in Figure 2.2. The section of the channel with the vertical banks, just below the Main Street Diversion, would be stabilized.

Flood control levees would be constructed to provide needed channel capacity and free-board in the areas shown in Figure 2.4. It would also be necessary to deepen a section of the Quichapa Channel (several hundred feet) between Coal Creek and I-15. This action may also require the replacement of the Coal Creek Bridge that spans the Quichapa Channel.

2.4.2.7 SUB-REACH E (WOODBURY DIVERSION STRUCTURE TO I-15)

To ensure that the recommended channel cross section and slope are maintained through this sub-reach, short levees or structural fill would be placed in low areas adjacent to the existing channel, primarily between the 1045 North Bridge and I-15 (Figure 2.4).

2.4.2.8 SUB-REACH F (I-15 TO AIRPORT ROAD)

If channel improvements are implemented in this sub-reach as part of this project, they would include constructing flood control levees on both sides of the channel and constructing a channel with a fairly uniform cross section and slope (Figure 2.2).

2.4.3 ALTERNATIVE B: RELOCATE MAIN STREET DIVERSION

In addition to the common elements described in Section 2.4.2, Alternative B proposes to demolish and remove the existing Main Street diversion structure and reconstruct a new diversion/drop structure approximately 1,600 feet upstream. This would require dropping the channel invert at the existing diversion structure location 6–10 feet and constructing a channel with an approximate bottom width of 50 feet, 2:1 side slopes, and a 1.9% channel slope from the existing structure location to a point approximately 1,600 feet upstream. The new structure would be approximately 50 feet wide to match upstream and downstream cross sections (Figure 2.2).

Figure 2.5 illustrates the infrastructure improvements associated with the relocated diversion structure. A large sedimentation basin would be constructed northeast of the creek above 100 East to remove gravel from irrigation water diverted from the creek. This basin would have the capacity to function properly under a design flow of 100 cfs. It would be approximately 175 feet long and 10 feet wide.

Finally, pipelines of varying diameters would be installed to convey diverted water from the sedimentation basin to existing canal heads. Approximately 1,600 linear feet of 42-inch pipeline would be needed to convey water from the sedimentation basin to an upper diversion structure (i.e., "Old Fort," which is adjacent to the original Main Street Diversion).

Water from the Old Fort diversion would be conveyed to a lower diversion structure and would be distributed to the three existing canals or ditches on the north side of the creek, with a pipe to each. Approximately 150 linear feet of 30-inch pipeline would convey water to the Union Field Canal. Approximately 150 linear feet of 36-inch pipeline would be used to convey water to the North Field/East Extension. Approximately 150 linear feet of 30-

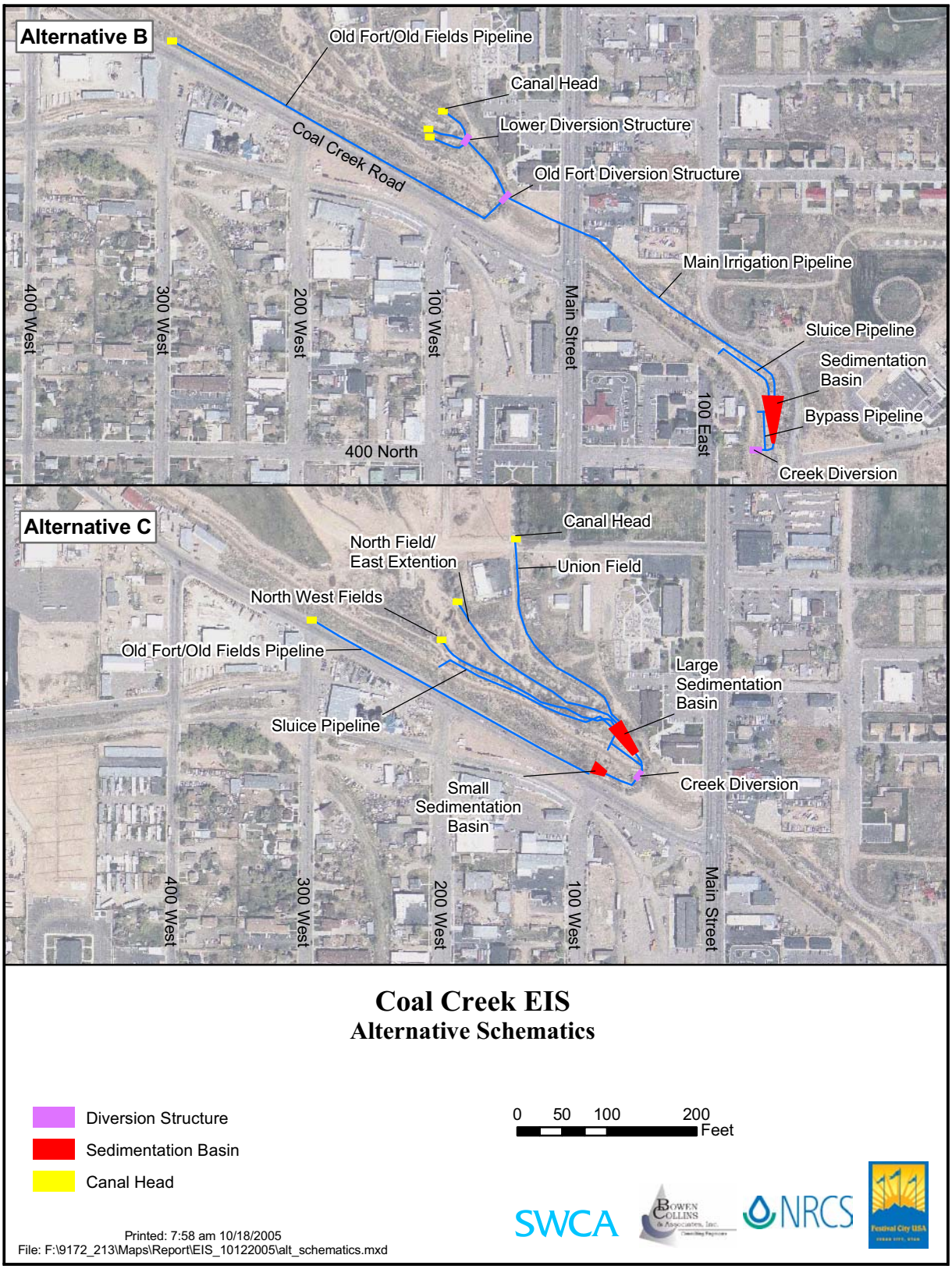

Figure 2.5. Proposed concepts for water diversion, sedimentation, and conveyance structures for Alternatives B and C.

inch pipeline would convey water from the lower diversion structure to a point where the water could be returned to the Northwest Fields ditch. Each of these pipelines would be buried in the existing canal ROWs.

In high-flow situations, water would also be diverted from the Old Fields diversion into the Old Fort/Old Fields ditch to the south, near the intersection of Coal Creek Road and 100 West Street. Approximately 1,200 linear feet of 21-inch pipe would be used to convey water from the Old Fort diversion structure to the point where it can be returned to the existing Old Fort/Old Fields pipeline; this pipe would be constructed in the same location as the existing pipeline. It would, however, be deeper.

A sluice pipeline would be constructed to convey sediment that settled out in the sedimentation basin back into the main channel. Additionally, a low-flow wasteway would be used to discharge low flows back into the creek immediately below the diversion structure, which would allow the diversion structure to remain clear of sediment during periods when no irrigation water is being diverted.

2.4.3.1 PARKWAY OPTION B1

Parkway Option B1 would develop/enhance the existing crosswalk at the Main Street Bridge to connect parkway trails (Figure 2.4). This option would require potential property or easement acquisition along the south side of the creek in the vicinity of the Main Street Bridge.

2.4.3.2 PARKWAY OPTION B2

Parkway Option B2 would develop/enhance trail using existing city sidewalks and ROWs. The trail would cross to the south side of the creek at a proposed 400 North pedestrian bridge, then follow the 400 North ROW to Main Street. The route would go north along the east side of Main Street to the Coal Creek crossing and use the street crosswalk to access the trail on the west side of the road (Figure 2.4). This option would not require property or easement acquisition.

2.4.4 ALTERNATIVE C: REPLACE MAIN STREET DIVERSION

In addition to the common elements described in Section 2.5, Alternative C proposes to construct a new diversion/drop structure where the existing Main Street diversion structure is located. This would entail dropping the channel invert at the existing diversion structure approximately 4 feet and constructing a channel with an approximate bottom width of 50 feet, 2:1 side slopes, and a 1.9% channel slope from the existing structure location approximately 1,500 feet upstream. The modified diversion structure would be approximately 50 feet wide to match upstream and downstream sections (Figure 2.2).

Figure 2.5 illustrates the proposed infrastructure improvements that would be associated with replacing the existing Main Street diversion structure. A large sedimentation basin north of the creek would be used to remove gravel from irrigation water diverted from the creek. This basin would have the capacity to function properly under a design flow of 90 cfs. It would be approximately 150 feet long and 40 feet wide.

Another small sedimentation basin, south of the creek, would be constructed to remove gravel from irrigation water being diverted into the Old Fort/Old Fields ditch. The basin would be approximately 50 feet long and 10 feet wide. Approximately 1,200 linear feet of 20-inch pipe would convey water from this small sedimentation basin to a point where it could be returned to the existing Old Fort/Old Fields pipeline near the intersection of Coal Creek Road and 300 West Street. This pipeline would be constructed in the same location as the existing pipeline. It would, however, be deeper.

Sluice pipelines would be constructed to convey sediment that settled out in the sedimentation basins back into the main channel. A low-flow wasteway would be used to discharge low flows back into the creek immediately below the diversion structure, which would allow the diversion structure to remain clear of sediment during periods when no irrigation water is being diverted.

Approximately 1,000 linear feet of 30-inch pipeline would be constructed to convey water from the large sedimentation basin to a point where water could be returned to the Union Field Canal. The pipe would be buried in the existing canal ROW.

A 36-inch pipeline would convey water 700 linear feet from the sedimentation basin to the North Field/East Extension. Another 700-foot section of 30-inch pipe would be constructed to convey water from the sedimentation basin to the Northwest Fields ditch canal. As with the other pipelines, these pipelines would be buried in the existing canal ROW.

The pedestrian truss bridge located just upstream of the 200 East Bridge does not provide sufficient freeboard to safely convey the 100-year flood. To address this capacity deficiency, the truss bridge would be removed alleviating the channel constriction in this area.

2.4.4.1 Parkway Option C1

Parkway pedestrian movement across Main Street would be accommodated by providing an underpass on the north side of the creek at the Main Street Bridge: in this case, a concrete path under the Main Street Bridge that would be elevated several feet above the channel invert. This option would require potential property or easement acquisition along the north side of the creek in the vicinity of the Main Street Bridge.

2.4.4.2 PARKWAY OPTION C2

Parkway Option C2 would connect the east and west parkway trails via a large box culvert constructed underneath Main Street (parallel to the creek) on the north side of the creek. The culvert would be dedicated to pedestrian use. This option would require potential property or easement acquisition on the north side of the creek near the Main Street Bridge.

2.5 COMPARISON OF ALTERNATIVES AND SUMMARY OF IMPACTS

The following table summarizes the environmental effects of each alternative by resource area. This brief comparative analysis is not intended to favor one alternative over another, but to present potential impacts to the human environment, so that they can be evaluated side-by-side and better lend themselves to an informed decision.

2.6 NATIONAL ECONOMIC DEVELOPMENT (NED) ALTERNATIVE

Based on economic analysis conducted in accordance with NED procedures prescribed by NRCS, Alternative C, Parkway Option C1, having the highest benefit-cost ratio of all the alternatives (3.47:1), is designated in this document as the NED Alternative.

2.7 PREFERRED ALTERNATIVE

The NRCS has indentified Alternative C, Parkway Option C1, as the preferred alternative.

Table 2.1. Summary of Environmental Impacts by Alternative

Resource/Issue	Alt A No Action	Alt B, Parkway Option B1 Relocate Main Street Diversion	Alt B, Parkway Option B2 Relocate Main Street Diversion	Alt C, Parkway Option C1 Replace Main Street Diversion	Alt C, Parkway Option C2 Replace Main Street Diversion
Air Quality	No exceedance of NAAQS is projected under this alternative. No appreciable, long-term air-quality effects are projected under this alternative.	No exceedance of NAAQS is projected under this alternative from either project-related emissions or as an accumulation of project-related emissions and existing background concentrations (where known). No appreciable, long-term, adverse air-quality effects are projected under this alternative.	The effects would be similar to Alt. B1.	The effects would be similar to Alt. B1.	The effects would be similar to Alt. B1.
Geology and Soils	Long-term, major, adverse affects on sediment dynamics and bank stability would occur. Sediment would continue to be deposited above the historical bridge constriction, Main Street Diversion, and the Woodbury Split, causing continued flooding. There would be continued, negative, adverse impacts to water conveyance infrastructure (e.g., agricultural canals and ditches). Bank stability would be inadequate to resist large flood events and subsequent lateral migration of banks.	Channel modifications would have direct, major, beneficial effects by reducing sediment deposition. Erosion control in the upper reaches of Coal Creek would have minor, beneficial effects on both the project area and downstream users. Channel modifications and parkway construction would result in short-term soil disturbance, increasing the chances of localized water and wind erosion. Total soil disturbance for Channel modifications would be 18.03 acres. Total soil disturbance for parkway construction of Parkway Option B1: 6.38 acres.	The effects would be similar to Alt. B1, except that the total soil disturbance for parkway construction would be slightly greater (6.50 acres).	The effects would be similar to Alt. B1, except that the total soil disturbance for Channel modifications would be slightly greater (18.47 acres) and total soil disturbance for parkway construction would be 6.44 acres.	The effects would be similar to Alt. C1.
Surface Water and Groundwater	Direct, adverse effects on surface water quality include elevated suspended sediment and turbidity generated from soil disturbance, in the case of channel dredging (minor, short-term), and erosion resulting from extreme flood and flow events (major, short- and long-term). No appreciable direct or indirect effects on groundwater quality are projected.	Short-term, adverse effects would include increased suspended concentrations, elevated turbidity, increased water temperature, and increased total dissolved solids and specific conductance. Long-term effects would beneficial and include decreased suspended concentrations and turbidity within and downstream of the project area due to reduced in-channel erosion, similar or decreased water temperatures due to planned, consistent revegetation activities; and decreased total dissolved solids and specific conductance due to reduced in-channel erosion.	Effects would be similar to Alt. B1.	Effects would be similar to Alt. B1, except that this alternative would not dewater any additional length of the creek channel.	Effects would be similar to Alt. C1.

Table 2.1. Summary of Environmental Impacts by Alternative, continued

Resource/Issue	Alt A No Action	Alt B, Parkway Option B1 Relocate Main Street Diversion	Alt B, Parkway Option B2 Relocate Main Street Diversion	Alt C, Parkway Option C1 Replace Main Street Diversion	Alt C, Parkway Option C2 Replace Main Street Diversion
Surface Water and Groundwater, continued		An adverse long-term effect would be the seasonal dewatering of an additional 1,600 of the Coal Creek channel downstream of the relocated diversion structure (sub-reach C). No appreciable direct or indirect effects on groundwater quality are projected.			
Vegetation	There would be minimal effects on type and abundance of vegetation under normal circumstances. In a 100-year flood event, the flow of water out of the banks and across the existing floodplain would have direct and indirect, adverse effects on vegetation which would mean a reduction in natural erosion control and mountain shrub and riparian vegetation in the project area. Another adverse effect would include increased chance for invasion of noxious weeds and other undesirable plant.	Dewatering 1,600 feet of Coal Creek would have little impact on the sagebrush/perennial grass community, but would result in mortality for many riparian species in that area. Construction and earth-moving activities associated with erosion control modifications, streambed widening, and streambank hardening would adversely affect 13.2 acres of vegetation. Indirect, adverse effects include an increased chance for invasion of noxious weeds and other undesirable plant species on 4.8 acres of relatively undisturbed mountain shrub and associated riparian habitat, and 8.3 acres of already disturbed sagebrush/perennial grass and associated riparian habitat. Parkway construction would include crushing, trampling, or uprooting of vegetation in approximately 5.7 acres. However, beneficial effects would include planting native vegetation in sections of the project area that are currently disturbed and/or weedy.	Effects would be similar to Alt B1.	Effects would be similar to Alt B1 with the following exceptions. Areas of impact on native vegetation would be slightly larger due to parkway construction (6.4 acres vs. 5.7 acres) and pipeline construction (0.6 acres vs. 0.5 acres) compared to Alternative B. The most substantial difference is that the riparian vegetation in the 1,600 feet of dewatered streambed (under Alt. B) would not be impacted.	Effects would be similar to Alt. C1.

Table 2.1. Summary of Environmental Impacts by Alternative, continued

Resource/Issue	Alt A No Action	Alt B, Parkway Option B1 Relocate Main Street Diversion	Alt B, Parkway Option B2 Relocate Main Street Diversion	Alt C, Parkway Option C1 Replace Main Street Diversion	Alt C, Parkway Option C2 Replace Main Street Diversion
Wetlands and Riparian	There would be minimal adverse effects to wetland and riparian resources within the project area. In a 100-year flood event, the flow of water out of the channel and across the existing floodplain could have direct and indirect effects on wetlands and riparian resources in the project area. Direct, adverse effects include uprooting of large trees and shrubs along the Coal Creek stream corridor, which would mean a reduction in natural erosion control, shade, and wildlife habitat.	In the middle and lower reaches, proposed levees would impact 2,231 linear feet of stream channel riparian vegetation, and proposed bank stabilization would impact 2,274 linear feet. Along the upper reach, approximately 6,988 linear feet of stream channel riparian vegetation would be disturbed for bank stabilization. The lower reach would not be affected, as there are no riparian/wetland resources in that area. Wetland resources would not be negatively, directly or indirectly, affected, as they are located off-channel or within an area that would not be altered by improvements.	Effects would be similar to Alt B1.	Effects would be similar to Alt. B1, except that there would be water in the stream to support an additional 1,600 feet of riparian vegetation.	Effects would be similar to Alt. C1.
Wildlife and TES	There would be negligible effects to special status species in the project area. Short-term, temporary disturbance from noise and general human activity related to maintenance activities or recreation within the creek may disturb wildlife.	There would be negligible effects to special status species in the project area, except any construction occurring Nov.-Mar. may temporarily displace wintering bald eagles from their roosts. This alternative would cause 11.31 acres of temporary, direct disturbance to black bear habitat and critical winter habitat for mule deer. Dewatering of the channel below the relocated diversion would affect remaining riparian habitat, resulting in individual mortality and potential extirpation of amphibious species using this stretch of the creek and temporary loss of some neo-tropical, migratory bird habitat in the project area. Revegetation from parkway would provide direct, beneficial effects for riparian vegetation and associated wildlife.	Effects would be similar to Alt. B1, except it would cause 11.20 acres of temporary, direct disturbance to black bear and mule deer critical winter habitat.	Effects on special status species would be similar to Alt. A, except for effects on bald eagle, which would be similar to Alt. B. Effects on mule deer and black bear habitat would be less but similar to Alt. B (9.76 acres affected). Because Alt. C would not dewater 1,600 feet of Coal Creek (as in Alt. B), riparian vegetation and associated habitat for aquatic and riparian species would be maintained.	Effects would be similar to Alt. C1.

Table 2.1. Summary of Environmental Impacts by Alternative, continued

Resource/Issue	Alt A No Action	Alt B, Parkway Option B1 Relocate Main Street Diversion	Alt B, Parkway Option B2 Relocate Main Street Diversion	Alt C, Parkway Option C1 Replace Main Street Diversion	Alt C, Parkway Option C2 Replace Main Street Diversion
Cultural	Site 42IN2277 (historic farmstead) and the Pioneer Iron Works Utah State Historic Site possess boundaries that would be affected if dredged material was stockpiled along the banks of Coal Creek. The other historic properties that are known to occupy the project area are less susceptible.	Potential dredging impacts would continue, though at a reduced frequency. Site 42IN2275 (the Main Street Diversion) would be demolished. The significant physical alteration or removal of three other historic properties: Site 42IN2282 (North West Field Canal); Site 42IN2283 (the North Field/East Extension Canal); and Site 42IN2284 (the Union Field Canal) would result in the reduction of the physical integrity of these historic properties to such an extent that they would no longer convey their eligibility for listing on the National Register of Historic Places. Site 42IN2279 would be removed and replaced, but is not eligible for listing on the National Register of Historic Places. Natural geological impacts to Site 42IN2279 (UP&L drop structure) that occurred during floods of 2005 would be stabilized, resulting in beneficial effects.	Effects would be similar to Alt. B1, except that routing of the parkway through the Pioneer Iron Works Utah State Historic Site would provide opportunity for enhanced public access to and interpretation of this historic property, resulting in beneficial effects.	Effects would be similar to Alt. B1, except that Parkway Option C1 would result in adverse impacts to two historic properties. Modifications to the design elements of the Main Street Bridge (Site 42IN2285) would occur, resulting in adverse effects. Additionally, UDOT Structure Number 021013C (the steel truss bridge) would be either demolished or relocated, resulting in significant adverse effects to this historic property.	Effects would be similar to Alt. C1.
Recreation and Visual	Effects on recreation and visual resources would be minimal. Current recreational opportunities would continue. Flooding along the trail may create hazards to pedestrians and may damage the existing trail or impact the aesthetic attributes of the current trail corridor	The current parkway would be lengthened from 2 to 5.5 miles and would add an estimated 8.3 additional acres of parkland available. Landscaping would enhance visual appeal and recreational experience. Coal Creek would be dewatered during irrigation season below the relocated diversion structure at 200 East. The improved parkway would be accessible to an additional 1,335 people within walking distance (0.75 miles) of the trail. Surface crossing at Main Street would diminish the aesthetic value and user experience on the trail as it abruptly transitions from the creek corridor to the urbanized and heavily traveled Main Street.	The current parkway would be lengthened from 2 to 5.5 miles and would add an estimated 8.3 additional acres of parkland available. Landscaping would enhance visual appeal and recreational experience. Coal Creek would be dewatered during irrigation season below the relocated diversion structure at 200 East. The improved parkway would be accessible to an additional 1,335 people within walking distance (0.75 miles) of the trail. Surface crossing at Main Street would diminish the aesthetic value and user experience on the trail as it abruptly transitions from the creek corridor to the urbanized and heavily traveled Main Street.	Effects would be similar to Alt. B1, except that Option 2 would increase the exposure to the urban environment. It would, however, offer an additional interpretive opportunity by allowing users to experience the historic Old Iron Mill site.	Effects would be similar to Alt. C1, except that the proposed box culvert for Option 2 would block all views of the creek and the surrounding bridge and vegetation as users pass through it.

Table 2.1. Summary of Environmental Impacts by Alternative, continued

Resource/Issue	Alt A No Action	Alt B, Parkway Option B1 Relocate Main Street Diversion	Alt B, Parkway Option B2 Relocate Main Street Diversion	Alt C, Parkway Option C1 Replace Main Street Diversion	Alt C, Parkway Option C2 Replace Main Street Diversion
Socioeconomics and Environmental Justice	There would be negligible effects on social and demographic characteristics of Cedar City. Flooding would cause economic hardship on those that may be underinsured. Flood insurance premiums, based on FEMA flood maps, would remain the same or increase. Economic effects from flood damage, changes in property values, and recreation benefits are captured in the NED analysis.	There would be beneficial effects on the social characteristics of Cedar City. The improved parkway trail would result in increased access to recreational opportunities, strengthened sense of community, and increased quality of life for all residents. There would be no disproportionate effects on minority or disadvantaged populations. Properties adjacent to the parkway would increase in value. Flood insurance premiums would decrease. The risk of flood damage would decrease. These effects are captured in the NED analysis.	Effects would be similar to Alt. B1.	Effects would be similar to Alt. B1.	Effects would be similar to Alt. B1.
National Economic Development	N/A	The benefit-cost ratio for this alternative is 3.96:1.	The benefit-cost ratio for this alternative is 3.94:1.	The benefit-cost ratio for this alternative is 4.00:1.	The benefit-cost ratio for this alternative is 3.89:1.

THIS PAGE INTENTIONALLY LEFT BLANK